EE/CA Report
Public Review Draft

PORT OF PORTLAND

Port of Portland
Portland, Oregon

May 31, 2005

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

EE/CA Report
Public Review Draft

Respectfully submitted,

BLASLAND, BOUCK & LEE, INC.

Philip A. Spadaro, L.G.
Senior Vice President

Kris Fabian, Ph.D., P.E.
Vice President

Paul Krause, Ph.D.
Associate

Mark Dunn Lewis, Ph.D.
NewFields

Prepared by:

Jamie Beaver	Carsten Becker
Alice Berg	Sean Covington
Jennifer Deters	Shannon Dunn
Kris Fabian	Glenn Grette
Paul Krause	Mark Lewis
Brooke Miller	Sara Moore
BC Robison	Philip A. Spadaro
Julie Sueker	Anne Summers
Randi Wexler	Steve Winter

BBL®
BLASLAND, BOUCK & LEE, INC.
engineers, scientists, economists

Table of Contents

Tables

Figures

Appendices

List of Acronyms

AOC	Administrative Order on Consent for Removal Action
ARAR	applicable or relevant and appropriate requirement
AST	aboveground storage tank
BEBRA	bank excavation and backfill remedial action
BSAF	biota-sediment accumulation factor
CDF	confined disposal facility
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COI	chemical of interest
COPC	chemical of potential concern
CSM	conceptual site model
CWA	Clean Water Act
cy	cubic yard
cy/hr	cubic yards per hour
DEQ	Oregon Department of Environmental Quality
DQO	data quality objective
DSL	Oregon Department of State Lands
EE/CA	engineering evaluation/cost analysis
ESA	Endangered Species Act
EU	exposure unit
FEMA	Federal Emergency Management Agency
HASP	health and safety plan
HQ	hazard quotient
IRM	International Raw Materials
KMBT	Kinder Morgan Bulk Terminals
LNAPL	light nonaqueous-phase liquid
LOAEL	lowest-observed-adverse-effects level
µg/kg	micrograms per kilogram
MNR	monitored natural recovery
NAPL	nonaqueous-phase liquid
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NJDOT/OMR	New Jersey Department of Transportation's Office of Maritime Resources
NOAEL	no-observed-adverse-effects level
NPL	National Priorities List
NPV	Net Present Value
NTCRA	Non-Time-Critical Removal Action
OHW	ordinary high water
O&M	operations and maintenance
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PEC	probable effects concentration
PPE	personal protective equipment
PRP	potentially responsible party

PRSC	post-removal site control
RAO	Removal Action Objective
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
SOW	statement of work
TBC	to be considered
TCLT	thin-column leaching test
TCLP	toxicity characteristics leaching procedure
TEC	threshold effects concentration
TRV	toxicity reference value
TSD	treatment, storage, and disposal
UCL95	95% upper confidence limit
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank

Executive Summary

Background

In 2000, the U.S. Environmental Protection Agency (USEPA) added the Portland Harbor Superfund Site to the National Priorities List. In fall 2001, the USEPA and ten of the Superfund Site's potentially responsible parties entered into an Administrative Order on Consent for a Remedial Investigation/Feasibility Study of the Superfund Site. The Administrative Order on Consent allows Early Actions to be conducted to address known contamination at specific locations within the Superfund Site. Contaminants found in Terminal 4 sediment samples during a remedial investigation directed by the Oregon Department of Environmental Quality (DEQ) led to a determination that a Removal Action at Terminal 4 is warranted. Accordingly, the Port of Portland (Port) is conducting a Non-Time-Critical Removal Action (NTCRA) under an Administrative Order on Consent for Removal Action (the AOC) executed by the Port and USEPA in October 2003.

The AOC requires the Port to conduct an engineering evaluation and cost analysis (EE/CA) for the Terminal 4 Removal Action in which various Removal Action alternatives are identified, compared, and ranked for their relative performance at meeting specific objectives associated with the evaluation criteria of effectiveness, implementability, and cost. An evaluation of the existing data identified a number of data gaps associated with the characteristics of the Removal Action Area and with the impact of those characteristics on the identification and evaluation of Removal Action alternatives. A field characterization effort was therefore designed to gather specific information regarding the physical, engineering, hydrogeologic, sediment quality, dredged sediment quality, and hydraulics and sedimentation characteristics of the Removal Action Area. This field effort was performed during May through September 2004. Following completion of the field and laboratory activities associated with the characterization effort, a characterization report (BBL, 2004b) was prepared and submitted to the USEPA.

Based on the available characterization data, including the newly collected data presented in the characterization report (BBL, 2004b), the Port evaluated potentially applicable technologies that would be considered for inclusion in the development of Removal Action alternatives. In accordance with the AOC, the feasible and implementable technologies and a suite of Removal Action alternatives that incorporate the screened technologies as components were presented to the USEPA, the DEQ, the Tribes, and the Trustees in a technical briefing on October 29, 2004. This EE/CA report summarizes the screening results. The Removal Action alternatives are then evaluated both individually and comparatively for their effectiveness, implementability, cost, and ability to achieve the stated Removal Action Objectives (RAOs) for the Terminal 4 Early Action. Following that analysis, a Preferred Alternative is identified.

Removal Action Area Characteristics

The Removal Action Area characteristics, which are relevant to the selection of technologies and alternatives appropriate to Terminal 4, and the methodologies by which the characteristics were determined are described in detail in the characterization report for the Terminal 4 Early Action (BBL, 2004b). Section 2 of this document provides brief summaries of the Removal Action Area characteristics. Appendices A and C through G of this

EE/CA report provide expanded summaries of Removal Action Area characteristics; an executive summary of Removal Action Area characteristics can be accessed in the characterization report (BBL, 2004b) as well.

Conceptual Model

A number of physical and chemical processes influence surface sediment contaminant concentrations within the Removal Action Area. Historical and potential ongoing sources – such as stormwater runoff, groundwater discharges, direct runoff and bank erosion, Removal Action Area sediment, operations, material handling, spills, and upstream contaminant sources to the Willamette River outside the Removal Action Area – may contribute contaminants to Terminal 4 sediment and surface water. Contaminant fate and transport within the surface sediment layer is controlled by several physical, biological, and chemical processes that together influence current and future surface sediment contaminant concentrations.

Section 3 presents the conceptual model of the Removal Action Area and summarizes the exposures and risks that may result from direct or indirect contact with sediment contaminants. The conceptual model of the Removal Action Area includes exposure pathways for human and ecological receptors to sediment contaminants, and the physical and chemical processes that control sediment contaminant concentrations. Section 3 also identifies specific chemicals of potential concern (COPCs) for specific receptor groups, such as benthic macroinvertebrates, birds, fish, wildlife, and humans. The purpose of the CSM is to identify the specific exposure pathways and receptors that are related to sediment contamination in the removal action area. This information was used to develop the Removal Action alternatives and will facilitate analysis of the residual (i.e., post-Removal Action) risks to ecological and human receptors following implementation of the Removal Action.

Removal Action Objectives

Section 4 reviews the RAOs initially established in the EE/CA work plan (BBL, 2004a), which are to:

- Reduce ecological and human health risks associated with sediment contamination within the Removal Action Area to acceptable levels.

- Reduce the likelihood of recontamination of sediments within the Removal Action Area.

The ability to achieve RAOs is one component of the evaluation of Removal Action alternatives. It is important to note that the Removal Action focuses on sediments within the Removal Action Area. The Removal Action will ultimately be part of the overall Remedial Action associated with the Portland Harbor Superfund Site. As such, the Removal Action is not intended to address all exposure pathways and environmental media within Terminal 4. The need for environmental cleanup for media other than sediments is being addressed by other programs, most notably the harborwide RI/FS under an Administrative Order on Consent with USEPA and the Upland Source Control program under Voluntary Cleanup Program agreements with DEQ. Achieving the RAOs for all receptors and pathways will be through a combination of actions resulting from all of the environmental programs.

Technology Screening

Section 5 summarizes the process through which technologies were screened to determine their appropriateness for inclusion in the development of Removal Action alternatives.

The Terminal 4 EE/CA work plan (BBL, 2004a) identified general technologies that would be considered for inclusion in the development of Removal Action alternatives. In accordance with USEPA guidance (USEPA, 1993) for NTCRAs, "only the most qualified technologies that apply to the media or source of contamination" should be considered. On that basis, the EE/CA work plan identified the following technologies for consideration in the development of Removal Action alternatives:

- monitored natural recovery (MNR), which may be applicable to portions of the Removal Action Area with low contaminant concentrations;

- in-situ capping of contaminated sediment; and

- sediment dredging (both mechanical and hydraulic) followed by auxiliary technologies such as transport, treatment, and/or onsite disposal of dredged sediments in a confined disposal facility (CDF) or offsite disposal of dredged sediments.

The Port screened these potentially applicable technologies to identify the technologies that are feasible and implementable at Terminal 4 and then assembled the Removal Action alternatives to include the screened technologies as components. Other factors considered in the development of the alternatives were the physical, chemical, and operational characteristics of the Removal Action Area and community feedback. In accordance with the AOC, the feasible and implementable technologies and a suite of Removal Action alternatives were presented to the USEPA, the DEQ, the Tribes, and the Trustees in a technical briefing on October 29, 2004.

Most of the technologies considered were found to be feasible, available, and applicable to the characteristics of Terminal 4, as summarized below.

- The screening analysis of MNR (which is discussed in Appendix B and detailed in Appendix H) resulted in a finding that MNR is a viable technology for a portion of Berth 401, a portion of Slip 1, a portion of Wheeler Bay, and the North of Berth 414 subarea. MNR has therefore been incorporated into the Removal Action alternatives.

- The screening analysis of capping technologies (which is discussed in Appendix B and detailed in Appendix I) resulted in a finding that capping in general is a technically feasible technology. Capping has therefore been incorporated into the Removal Action alternatives. The types of caps that might be needed to control erosion on steep slopes, such as concrete mattresses, were retained for further consideration during the design phase. Sand or gravel caps were retained for further consideration in parts of the Removal Action Area where the slopes are less steep and areas are less exposed to hydraulic forces and erosional impacts.

- The screening analysis of dredging technologies (which is discussed in Appendix B and detailed in Appendix J) resulted in a finding that dredging in general is a technically feasible technology. Dredging has therefore been incorporated into the Removal Action alternatives. Dredge types with wide availability and applicability to the Removal Action Area are mechanical dredge with open clamshell bucket, mechanical dredge with enclosed clamshell bucket, and hydraulic cutterhead dredge and hydraulic dredge, which was retained for possible use in conjunction with onsite disposal in a CDF.

- The screening analysis of transport technologies for dredged sediment (Appendix B) resulted in a finding that all the technologies considered (rail, barge, and truck and, for onsite disposal in a CDF, pipeline) are feasible, and none of the technologies was eliminated from consideration for the Terminal 4 Removal Action.

- The screening analysis of treatment technologies for dredged sediment (Appendix B) resulted in a finding that none of the treatment technologies considered (thermal treatment, extraction, chemical treatment, biological treatment/bioremediation, and immobilization) is appropriate for inclusion in the Removal Action alternatives. Treatment technologies for dredged sediment are either not feasible, not commercially available, or not applicable to the types of contaminants that are prevalent at Terminal 4. In addition, none of the surveyed vendors offering a process with potential applicability to the Removal Action Area sediments was interested in pursuing a project of this limited size and duration.

- The screening analysis of disposal technologies for dredged sediment (Appendix B) resulted in a finding that onsite disposal in a CDF and offsite disposal at a USEPA-approved landfill are both technically feasible technologies. Both disposal technologies have therefore been incorporated into the Removal Action alternatives. Appendix K details the evaluation of CDF feasibility.

- In addition, certain materials handling processes, such as dewatering and stabilization, were retained as technologies that may be considered to facilitate transportation and disposal of dredged sediment.

Applicable or Relevant and Appropriate Requirements

Section 6 identifies the legally applicable or relevant and appropriate requirements (ARARs) that may govern the Terminal 4 Removal Action. The ARARs fall into three classifications:

- Location-specific requirements are restrictions on activities based on the characteristics of a site or its immediate environment.

- Chemical-specific requirements are health- or risk-based concentration limits or ranges for specific hazardous substances, pollutants, or contaminants in various environmental media.

- Action-specific requirements are controls or restrictions on particular types of activities such as hazardous waste management or wastewater treatment.

In addition, the USEPA has developed another category called "to be considered" (TBCs), which includes non-promulgated criteria, guidance, and proposed standards issued by federal or state governments. While

compliance with TBCs are not mandatory, TBCs may provide guidance on how to carry out certain actions or requirements

The ability of the Removal Action alternatives and the Preferred Alternative to achieve compliance with ARARs is a threshold criterion that must be met for this action.

Identification of Removal Action Alternatives

Section 7 summarizes the process by which Removal Action alternatives were developed and describes the alternatives. Following an analysis of the chemical, physical, and operational characteristics of the Removal Action Area's five subareas (Slip 1, Berth 401, Slip 3, Wheeler Bay, and the North of Berth 414 area), applicable technologies – monitored natural recovery, sediment capping, and/or sediment dredging with onsite or offsite disposal – are determined for each subarea. Five Removal Action alternatives addressing all five subareas are then assembled:

- No Action Alternative (required by statute as baseline against which to evaluate the other alternatives);
- Alternative A – MNR Emphasis;
- Alternative B – Cap Emphasis;
- Alternative C – Dredge Emphasis with CDF Disposal; and
- Alternative D – Dredge Emphasis with Landfill Disposal.

Alternatives A, B, C, and D all have MNR, capping, and dredging as components of the Removal Action, but vary in the degree to which they apply the technologies deemed feasible for Terminal 4. For instance, the estimated volume of dredged sediment ranges from 105,000 cubic yards (cy) under Alternatives A and B, which emphasize monitored natural recovery and capping, to 204,000 cy under Alternative D, which emphasizes dredging as a principal component. Only Alternative C includes onsite disposal of the dredged material in a CDF. Detailed descriptions of Alternatives A through D and how they would be applied in the five subareas are provided in Section 7.

Evaluation of Removal Action Alternatives

Section 8 evaluates the Removal Action alternatives, both individually and comparatively, for:

- effectiveness, as evidenced through the evaluation criteria of overall protection of public health and the environment; compliance with ARARs; long-term effectiveness; reduction of mobility, volume, and toxicity of wastes; and short-term effectiveness;
- implementability, as evidenced through the evaluation criteria of technical and administrative feasibility and availability; and
- cost.

Alternatives A, B, C, and D are all found to be effective and implementable. The estimated costs (total net present value) of the alternatives are $23,303,000 for Alternative A, $24,627,000 for Alternative B, $30,555,000 for Alternative C, and $26,431,000 for Alternative D. The CDF in Alternative C offers excess capacity that could be used for the disposal of contaminated sediments from other sites within the Portland Harbor Superfund

Site, as well as for the placement of other suitable sediments or fill; the estimated value of this excess capacity is placed at $10,000,000. Incorporating the estimated value of the excess capacity of the CDF, the net estimated cost of Alternative C is approximately $20,555,000.

On the basis of a comparative evaluation of the Removal Action alternatives against the CERCLA criteria, the alternatives are ranked by their scores on a scale of -1 to 1, in which -1 indicates an alternative is less favorable than the compared alternative; 0 indicates the two compared alternatives are equal; and 1 indicates an alternative is favored over the compared alternative. The four active alternatives are ranked in the following order:

- Alternative C (overall average score of 0.1333) is ranked the highest, reflecting its greatest overall relative performance at meeting the requirements of the evaluation criteria.
- Alternative B ranks second (overall average score of -0.1111).
- Alternative A ranks third (overall average score of -0.1222).
- Alternative D is considered to exhibit the least overall relative performance at meeting the requirements of the evaluation criteria and as a result ranks lowest of the four active alternatives (overall average score of -0.3).

The No Action alternative is not ranked, because it fails to meet the threshold criteria.

Preferred Alternative

Section 9 draws on the comparative analysis and ranking of alternatives and on USEPA guidance for conducting NTCRAs to identify the Preferred Alternative and provide the rationale for its selection. Alternative C is the Preferred Alternative because it best meets the evaluation criteria. Alternative C will meet the substantive requirements of the ARARs and offers greater overall protection of human health and the environment than do the other alternatives, because:

- The most contaminated sediment will be contained in a CDF designed and constructed to be protective of human health and the environment.
- Handling and transport of the contaminated sediments are minimized and kept within the Terminal 4 facility.
- The construction activities associated with implementation of the Preferred Alternative are essentially confined to the Terminal 4 facility, with little impact to the local community.
- The short-term risk of recontamination during implementation is minimized because a relatively small volume of sediment is moved over the shortest distance and because the contaminated sediment will be isolated from the Willamette River by a berm.
- The long-term risk of recontamination is reduced because Slip 1 is eliminated.

The Preferred Alternative is expected to exhibit relatively high short-term effectiveness, since its main components of dredging and CDF construction represent relatively little risk to the community, to site workers, and to the environment, and the duration of these activities is relatively short.

In addition, Alternative C is most compliant with the NTCRA requirement "to avoid wasteful, repetitive, short-term actions that do not contribute to the efficient, cost-effective performance of a long-term remedial action" (USEPA, 1993). Alternative C has the potential to contribute to the efficient, cost-effective performance of a long-term remedial action for the entire Portland Harbor Superfund Site because it provides a CDF disposal option that is nearby, efficient, and cost-effective and that decreases sediment management and handling.

Land created by filling Slip 1 would be used for water-dependent purposes consistent with existing zoning and current Port marine use at the Terminal 4 facility.

Recontamination Potential

The Preferred Alternative must also achieve the RAO of reducing the likelihood of recontamination of sediments within the Removal Action Area. Section 10 (reserved for this draft) presents an analysis of the recontamination potential of the Preferred Alternative.

Removal Action Process

Upon the approval of this EE/CA, USEPA will issue an Action Memorandum to document the selection of the removal action alternative proposed for implementation. Following the Action Memorandum, the Port is required to prepare a number of additional deliverables specified in the AOC and SOW prior to removal action construction activities. For the Removal Action design and implementation, these include:

- Removal Action Design Documents including construction drawings and specifications at various completion levels such as conceptual level (representing a 30% completion), pre-final (representing a 60% level of completion) and final, i.e., 100% complete design documents; and a

- Removal Action Work Plan that will describe the construction activities and their schedule, and will also include procedures to protect the public, site workers and the environment during field activities, and construction quality assurance procedures to ensure that the Removal Action Objectives and performance standards will be met.

The removal action design will involve the preparation of design calculations and analyses to work out design details, the preparation of design drawings, specifications, setting performance standards and procedures to verify that RAOs have been met. This design development process will gradually increase the specificity of the project details, in terms of refining areas and volumes of sediment involved, selecting construction processes, technology and equipment, disposal facilities and material borrow sources, and other project particulars. This process will culminate in the final (100%) design documentation that will provide specific project execution requirements and a combination of prescriptive specifications (where deemed necessary) and performance requirements (where appropriate to allow flexibility to contractors). The 100% (final) design will be used to competitively procure contractors for the implementation of the removal action in the field.

Construction of the Removal Action may affect aquatic environments in the Removal Action Area depending on the Alternative that is selected by USEPA. In accordance with the Clean Water Act, the Port will design and implement appropriate mitigation to offset the impacts to aquatic habitat. The mitigation planning process will proceed in parallel with the removal action design, and a final mitigation plan will be submitted with the final project design.

Upon the completion of the removal action field activities, the Port will prepare the Removal Action Completion Report and will also submit a Long-Term Monitoring and Reporting Plan and will commence long term monitoring activities.

Throughout the process, the Port has maintained an extensive community outreach effort, coordinated with EPA's community involvement programs and also coordinated with DEQ. This effort will continue through final construction of the Removal Action.